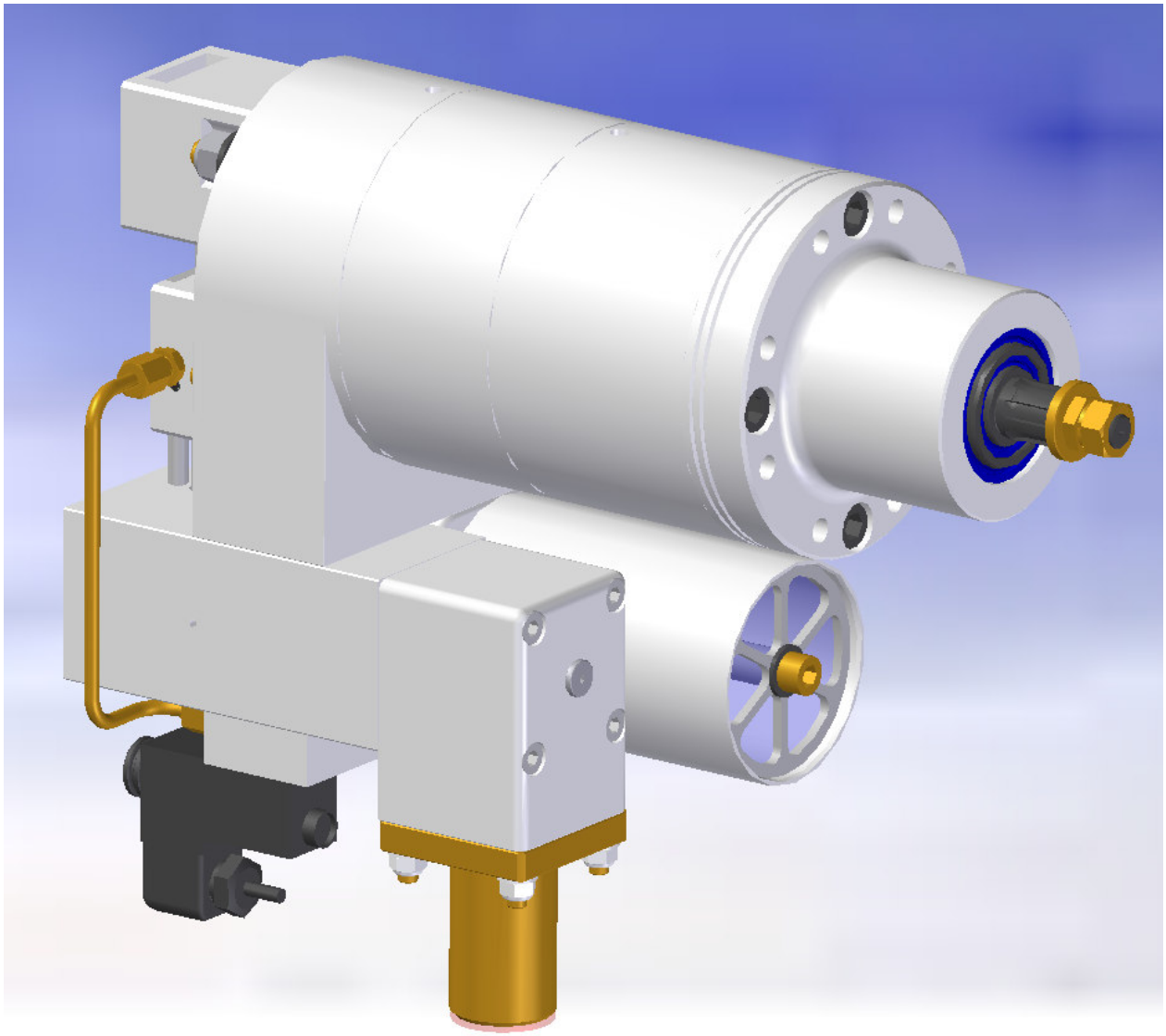


SERVICE MANUAL
S30 AIR STARTER
51306800-100 / 51307800-100

INDEX:

HOW TO USE THIS MANUAL

	**MANDATORY REQUIREMENT:** ANY INSTALLATION OF THE STARTER THAT DOES NOT COMPLY WITH THIS REQUIREMENT SHALL BE CONSIDERED NON-CONFORMING.
	**RECOMMENDATION:** TO OBTAIN MAXIMUM LIFETIME AND BEST OPERATION OF THE STARTER.

1.- INTRODUCTION TO AIR STARTER SERIES S

The GALI air starters are devices generally installed as auxiliary units of thermal motors or turbines, for their start-up.

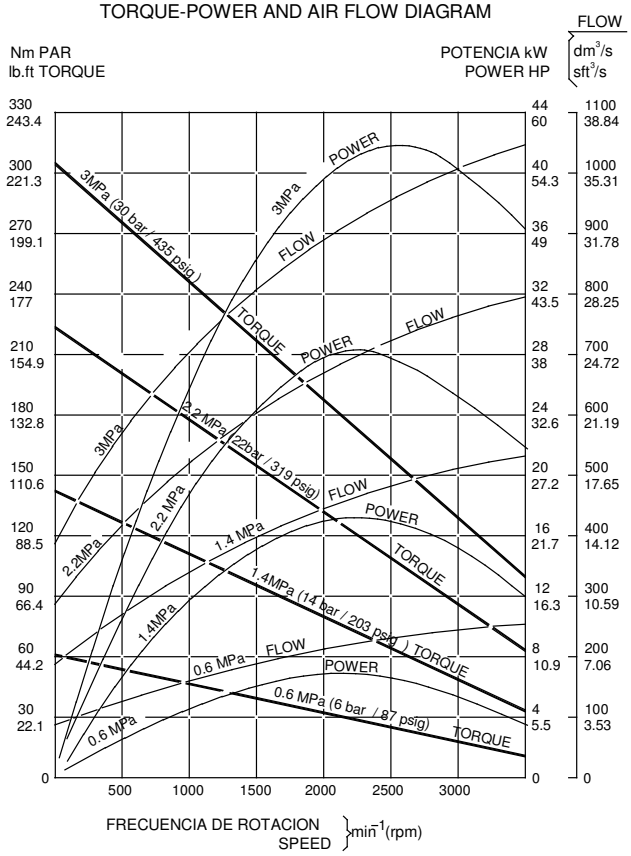
These starters are based on the principle of two geared rotors, which are turned through the action of compressed air. This movement is subjected to the appropriate reduction to obtain a determined torque on the output shaft. To this shaft the appropriate pinion is fitted and the movement thereof pulls the motor that is desired to start. This pulling action is achieved engaging the pinion of the starter with a crown wheel usually fitted on the flywheel of the motor.

The starters have internal mechanisms to achieve the engagement and avoid their start-up until it has been carried out successfully. They are also provided with a device that avoids reengagement.

1.1.- TECHNICAL DATA

	S30
MAXIMUM POWER	41.5 kW
MAXIMUM TORQUE	305 Nm
MAXIMUM WORKING PRESSURE	3 MPa (30 bar / 435psig)
NET WEIGHT	21 kg (*)
SPEED AT MAXIMUM POWER	2500 min^{-1} (rpm)
MAXIMUM FREQUENCY	3500 min^{-1} (rpm)
SOUND LEVEL	120dB (*)

DIAGRAMA DE PAR-POTENCIA Y CAUDAL
TORQUE-POWER AND AIR FLOW DIAGRAM



(*) Medium value for standard configuration. Different accessories may change these values.

1.2.- .- DESIGNATION

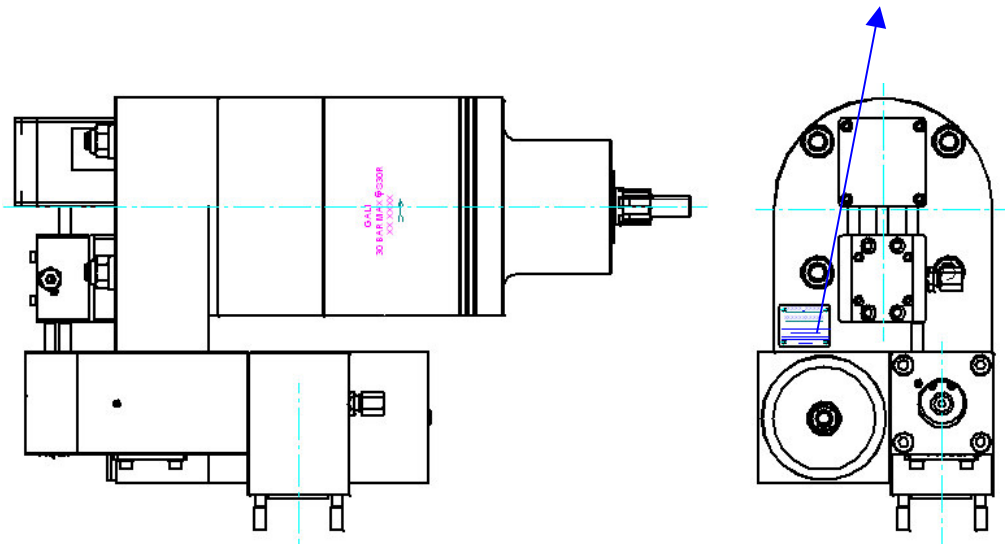
All starters have the following data marked on the body:

GALI 30 BAR MAX G S30 X	(turning direction X: R - right , CW / L – left, CCW)
NUMBER OF BASE ROTATION	(indicated by an arrow, according to turning direction)

Each starter comes with its corresponding identification plate (mounted on the head), which includes the following data:

SERIAL NUMBER / YEAR OF MANUFACTURE----- →
UNIT REFERENCE---------- -→

ADDRESS OF THE MANUFACTURER ----------→



Designation of the turning sense on an internal combustion engine: follow the one on the ISO 1204:1990 standard, which consider a viewer lloking at the engine from the output shaft of it; it's said as clockwise the direction that the hands of a clock move and counter clockwise the opposite sense.

Designation of the turning sense on a GALI air starter: follow the same standard, looking the starter from the pinion. It's showed clockwise as (R) and counter clockwise as (L).

DECLARATION OF THE MANUFACTURER

We,

GALI INTERNACIONAL, S.A.
Polígono Industrial Mas d'en Cisa
C/ Josep Tura, 5
08181-Sentmenat - BARCELONA
SPAIN

declare that the unit:

Trade: **GALÍ**
Type: Air Starter
Model: S30

is in conformity with the following European Directives:

- **Machinery Directive 98/37/EC**
- **Pressure Equipment Directive 97/23/EC**

In the design and construction thereof the following harmonised European standards have been applied:

ISO 12100:2003	**Machine Safety. Basic concepts, general principles for design thereof.** Part 1: Basic terminology, methodology. Part 2: Basic principles and specifications.
EN 1050	**Machine Safety. Risk Evaluation.**
EN 983	**Safety requirements for systems and components for hydraulic and air transmissions. Air.**

IT IS FORBIDDEN TO PUT THIS MACHINE IN SERVICE BEFORE IT HAS BEEN INSTALLED FOLLOWING THE DIRECTIONS OF THE SERVICE MANUAL AND BEFORE THE INSTALLATION AS A WHOLE HAS BEEN DECLARED CONFORMING TO THE PRECEDING DIRECTIVES

Sentmenat, march the 1st 2007.

Llorenç Gali

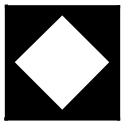
2.- TRANSPORT AND STORAGE, ASSEMBLY AND DISMANTLING

2.1.- TRANSPORT AND STORAGE

The reduced weight of the GALI starters allows their handling by a single operative for the jobs of maintenance, assembly and dismantling.

The geometry of the starter is such that it is easy to locate fastening elements, which allows its transport, or lifting.

The packing which they are provided with for delivery facilitates transport and storage, at the same time as it protects the starter from possible blows or surface damages.

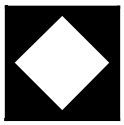
	The starters leave the factory with anti-rust grease that protects the internal mechanisms. Nevertheless, it is recommended to store them in a dry place.

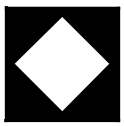
2.2.- ASSEMBLY

Completely remove the packing material. Remove the plastic caps that plug the holes corresponding to the inlet nozzle and to the air outlets for accessories. The unique function of these plugs is to avoid dirt penetration to the interior of the starter before its final assembly.

	In case any of the holes foreseen for reading the pressure (see point 3.3) are not used for this purpose, close them in a secure manner by means of the corresponding threaded caps and gaskets.

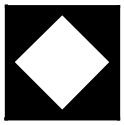
2.3.- - DISMANTLING

	Cover the access holes to the interior of the starter appropriately, avoiding the possible entry of dirt or particles of any type. Take particular care with the caps themselves, which could introduce or release loose particles into the interior.

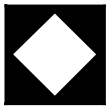
	In the event of the starter incorporating an electro valve, protect this particularly from impact. If the starter will remain dismantled a long time, protect the pinion and output shaft of the starter by means of oil or grease to prevent rusting.

3- INSTALLATION

3.1- POSITIONING AND ALIGNMENT

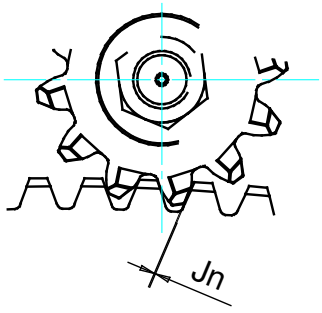
	It is recommended the starter to be fixed to the engine by means of a front flange.

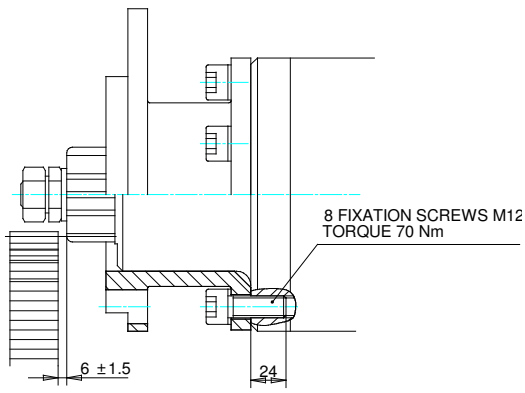
GALI can supply standard flanges, or tailored according to order requirements.

	The starter can be mounted on any position on the motor, the most recommendable being to locate the silencer below the drive pinion shaft.

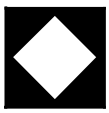
	If the coupling has to be made unavoidably by cylindrical cradle, it is necessary to check that this adapts perfectly without producing local stress, assisting it if necessary with an annular clamp.

	It should be verified that there is adequate gap (Jn) between drive pinion and crown wheel, and that it is constant over the length of the tooth edge. Check if the front distance of the gearing follows the indications. Also respect the screw tightening torques of the following diagram.





m (DP)	alfa	Jn (mm)
2.540 (10)	20º	0.3 – 0.6
2.75		
3		
3.175 (8)		
3.5		0.4 – 0.7
4.233 (6)		
3	15º	
3.5		0.7 - 1
2.117 (12)		0.3 – 0.5
	12º	

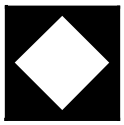
	The starter has to be firmly joined to the motor body (not to the bed or other attached elements). To avoid vibrations between the starter and the connection pipe, the installation is recommended near the starter of a straight length of flexible pipe of at least 300 mm, which complies with the regulations relative to pipes under pressure (97/23/EC).

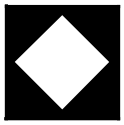
	If it is not possible to secure the starter to the body of the motor, make sure that in the operation thereof no vibrations are produced which affect the distance between the drive pinion and the crown wheel of the motor flywheel.

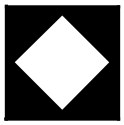
3.2.- SUPPLY OF COMPRESSED AIR

The starter is designed to deliver its maximum torque at 3MPa (435 psi, 30 bar), although this pressure will not always be necessary to carry out start-up. The minimum pressure necessary to achieve motor start-up will depend on each specific application. GALI guarantees that all S30 starters carry out the engaging movement and main valve opening at least up to 0.6 MPa.

	**In no case should the starter be subjected to pressures greater than 3 MPa (435 psi, 30 bar).**

	The air should arrive at the starter clean and dry (ISO 8573-1:2001 maximum diameter of particles 800 microns; maximum humidity 30 g/m3). It is recommended to fit an automatic purge in the tank and a GALI air filter connected immediately before the starter. The installation should foresee a horizontal stretch to install the filter.

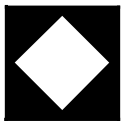
	Unless expresely recommended otherwise, the inside diameter of the feeding pipe should not at any point be less than 36 mm or 1 3/8”.

	In case of long pipes, the inside diameter should be greater than the minimum recommended. The feeding pipe should be as short as possible and have a minimum of direction changes.

	**To guarantee safety in starter maintenance, it is necessary to incorporate a lockable and airtight shutoff valve, which assures the isolation against pressure in the access line to the starter when the valve is closed.**

3.3.- PRESSURE TAKE-OFF

The starters have two couplers for 6 mm pipe diameter, G1/8” threaded, one for taking the pressure and the other one for the start signal input. If the starter incorporates a solenoid valve, the couplers are replaced with a coupling socket. When the starter is delivered, these sockets are plugged with the corresponding airtight cap.

	It is recommended to use the free pressure socket to fit a pressure gauge, 0-4 MPa.

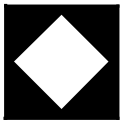
3.4. - SUPPLY OF ELECTRIC POWER

In the cases where the control system incorporates a solenoid valve directly assembled on the starter, it will be necessary to connect the supply voltage, according to the indications for the same.

	**The electrical installation has to comply with the requirements of the Low Voltage Electro technical Regulations.**

4.- FIRST START-UP

4.1.- AIR FEEDING CIRCUIT

	The pipe should be cleaned with compressed air before being coupled to the starter, taking particular care to prevent loose particles reaching the interior, due to welding of the pipes or for any other reason.

4.2.- CHECKING ASSEMBLY

	**Carry out all the installation checks without pressure in the line.**

Check that the installation has been made in accordance with the general instructions provided above. In particular, verify that the line has no restrictions, with regard to that indicated in point 3.2.

Check the fastening of all elements and the installation of the necessary gaskets to guarantee air-tightness in the unions between elements.

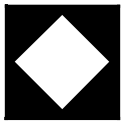
4.3.- PUTTING INTO SERVICE

ALWAYS RESPECT THE SAFETY INSTRUCTIONS OF POINT 6 OF THIS MANUAL

	**Before connecting the starter to an installation that is in service, the air should always be discharged from it.**

Once the installation is finished, open the air feed valve carefully, observing if there is any leak; in such a case, close it again, empty the pipe slowly and solve the problem.

Apply short low-pressure bursts manually. Ensure the meshing between the pinion and crown wheel of the engine is correct.

	**Do not make the starter work at pressures greater than those indicated in the characteristics of the unit.**
	The installation of a pressure gauge connected to the pipe in the air intake to the starter allows you to make sure that there is no air remaining in the circuit and, when the starter is working, it will be possible to determine the effective air feed pressure.

5.- OPERATION

5.1.- START-UP AND ENGAGE

The starter has two successive operations:

- First action: in which the pinion carries out an approach movement to the crown wheel and simultaneously a double turn that favours the engage of both elements. Only when it has been completed successfully it's possible to proceed to the second movement.
- Second movement: the main valve is opened, giving to the motor body the possibility to develop its maximum power.

5.2.- START UP

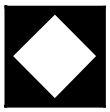
Once the second movement has been carried out, the starter accelerates the motor very quickly, thereby reducing losses in the cylinders to the maximum until the compression is achieved under appropriate conditions for producing ignition if the fuel feed is correct.

5.3.- SHUTDOWN

The shutdown can take place for different reasons:

5.3.1.- FOR ABSENCE OF SIGNAL

If the signal fed by the solenoid valve or the air plunger is cut off, the starter is stopped and disengages.

	Control of the signal time can contribute to reduce the consumption of start-up air and length the useful life of the starter.

5.3.2.- FOR BACKWARD MOTION OF THE DRIVE PINION

At the moment when the motor comes into operation on its own, its torque, greater than starter's one, causes disengagement and an internal mechanism produces starter shutdown.

5.4.- DISENGAGE

When shutdown takes place for any of the reasons indicated in point 5.3, the drive pinion is automatically withdrawn to the idle position.

5.5.- RESTART

When the starter has been stopped, it will remain immobile until the control air pressure disappears (solenoid valve or plunger), for which reason, in order to operate the starter again, it is necessary to cease acting on the plunger or to disable the solenoid valve briefly.

Since the actual starter mechanisms are unable to detect whether the motor is working or it has stopped after a start-up intent, this operation prevents the starter from insisting on another engage action while the person in charge of controlling the same is not sure that the motor is totally at rest, preventing the drive pinion from attempting to engage if the crown wheel of the motor is still in motion, which could lead to serious damage.

	Before attempting a new start-up always make sure that the crown wheel of the motor has stopped.

6.- SAFETY INDICATIONS

	**Always pay the maximum attention to possible air leaks. Always wear ear protection when this starter is tested or compressed air discharges are made in the installation. In the exhaust high sonic energy levels can be produced.**
	**Always wear suitable eye protection for any maintenance operation of the starter.**
	**For any operation on the starter, you should always close the supply and empty the air feed pipe, by acting on the plunger when the installation is by air and the electrically controlled valve button when the installation is electric.** **Disconnect, by means of a lockable shutoff valve, the air supply hose before installing, dismantling or adjusting any accessory of this starter. The lock should remain in place until operations on the starter are completed.** **Before connecting the starter to an installation that is in service, you should always discharge the air pressure in the same. If there is a pressure gauge at the inlet to the starter, use it to check for absence of pressure.**
	**To avoid the risk of explosion, refrain from using air hoses or couplings in the installation, which are damaged or have not been accepted by the competent inspection.** **Never make the equipment work above the maximum useable pressure (3 MPa). If there is a pressure gauge at the inlet to the starter, use it to check the absence of pressure.**
	**Hands or other body parts (and garments, as ties) should be kept clear of the drive pinion of the starter or the crown wheel of the motor when air pressure is present in the start-up installation.** **Risk of impact and entrapment.**
	**Do not position yourself in the discharge area of compressed air (within approximately 3m from the exhaust silencer) during start-up, nor leave loose objects there that could be displaced by the same.**

7.- MAINTENANCE

7.1.- GENERAL PRECAUTIONS

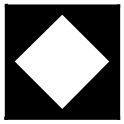
ALWAYS RESPECT SAFETY INDICATIONS DESCRIBED IN POINT 6 OF THIS MANUAL

Always close the shutoff valve with a padlock when carrying out any kind of maintenance task on the installation. Discharge the air remaining in the pipe by activating the electrically controlled valve (the starter will try to work, pay attention to the movements that take place), or else allow this air to discharge smoothly by slowly loosening any plug. **If there is a pressure gauge at the inlet to the starter, use it to check the absence of pressure.**

	Always use original GALI spare parts. The spare parts that are not GALI originals can generate hazards or malfunctioning of the starter.

7.2.- MAINTENANCE PROGRAM

The preventive maintenance of the GALI starters greatly depends on the use that the corresponding user makes thereof, both for the frequency of start-ups and for the type of motor. Indeed, a starter that never works deteriorates more quickly than one which does so with a certain frequency (for example, once a week).

	**If for maintenance reasons the tension washer located in the back part of the body of main valve should be removed, be sure to re-assembly it again properly. An incorrect assembly of the same could cause that some elements came out at great speed shot.**
	To achieve maximum duration and reliability in the operation of the GALI starter, the maintenance program should be carried out which is detailed next.

7.2.1.-MONTHLY REVISION

M01	GENERAL REVISION OF INSTALLATION		
	Action to carry out	**Tools**	**In the event of defect**
1	Observe if there are leaks in the installation.	Visual	Close the corresponding general shutoff valve, empty the pipe and replace deteriorated element.
2	Observe if there are cracks in flexible pipe	Visual	Close the corresponding general shutoff valve, empty the pipe and replace flexible pipe.
3	Close the general shutoff valve with padlock and empty the pipe slowly.	Manually	
4	Observe wear in flanks of the drive pinion	Visual	Remove lock nut, fit new pinion and replace the nut with the corresponding torque (10.1)
5	Observe cracks or marks of the drive pinion	Visual	Remove lock nut, fit new pinion and replace the nut with the corresponding torque (10.1)

6	Rotate the pinion manually	Manually	Carry out starter internal inspection M05.
7	Verify tightness of front securing screws	Torque wrench	Set torque 70 Nm
8	Verify tightness of pinion securing nut	Torque wrench	Set torque 76 Nm
9	Verify state of wiring if there is	Visual	Replace wiring and protect it appropriately
10	Verify electrically controlled valve securing	Visual	Retighten screws
11	Open general shutoff valve		

M02	**CLEANING EXTERNAL FILTER**		
	Action to carry out	**Tools**	**In the event of defect**
1	Close the general shutoff valve with padlock and empty the pipe slowly.	Manually As per M01.3	
2	Loosen the drainage plug of the filter	Set key 13	Permit accumulated water to drain.
3	Tighten the drainage filter plug	Set key 13	

7.2.2.- ANNUAL REVISION

Be sure to have at hand a SET OF SEALS 5290036.

M04	**GENERAL REVISION: CHANGE SET OF GASKETS**		
	Action to carry out	**Tools**	**In the event of defect**
1	Close the general shutoff valve with padlock and empty the pipe slowly.	Manually As per M01.3	
2	Disassembly the main valve.		Follow disassembly instructions – main valve.
3	Remove all o-rings and membranes.		Replace by new parts from set of seals.
4	Assembly all parts in the opposite way.		
5	Open general shutoff valve.		
6	Pay attention to air leakages.		Tighten any needed part.

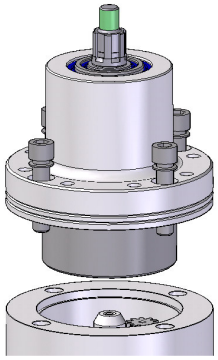
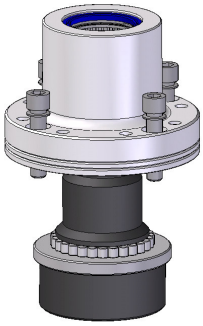
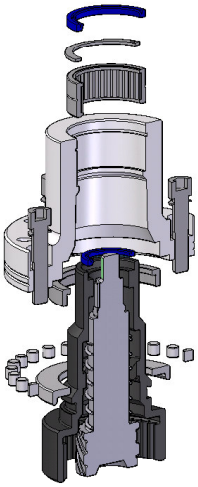
Be sure to have at hand a REPAIR KIT 5290831.

M05	**GENERAL REVISION: REVISION OF ROTORS AND LUBRICATION**		
	Action to carry out	**Tools**	**In the event of defect**
1	Close the general shutoff valve with padlock and empty the pipe.	As per M01.3	
2	Disassembly the Motor body		Follow disassembly instructions – motor body (usually, it will be not a need to extract closing rings).
3	Examine state of rotors (wear, cracks, etc.)	Visual	Replace with new rotors from repair kit
4	Examine state of bearings	Manual	Replace with new bearings
5	Grease bearings	Grease KLUBERPLEX BEM 34-132	
6	Grease the outer toothed axle of main rotor	Grease KLUBER KL COMPLEX	
7	Assembly the body, in the oppsite way.		
8	Open general shutoff valve		
9	Pay attention to air leakages.		Tighten any needed part.

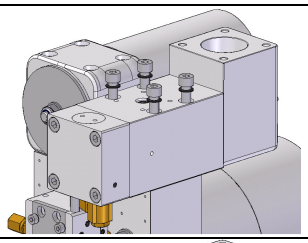
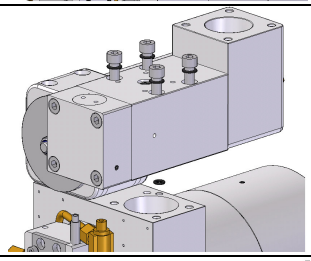
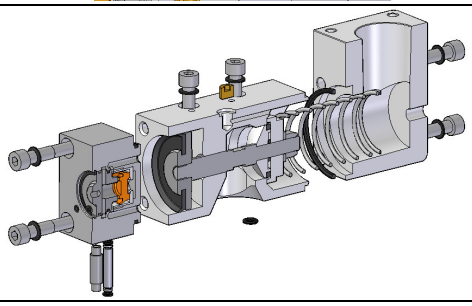
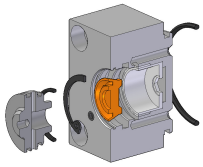
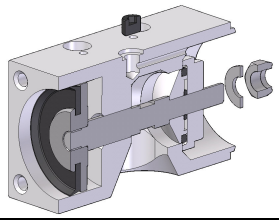
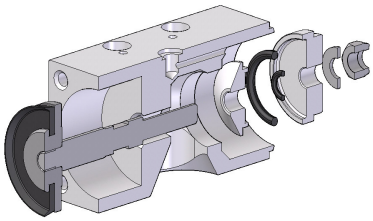
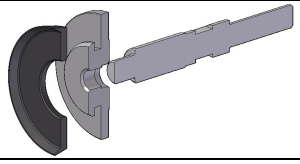
	For lubrication always use the grease and oil indicated below: O-rings: TELLUS 32 oil. Bearings and rollers: KLUBERPLEX BEM 34-132 grease. Main rotor and splined shaft : KRAFFT KL COMPLEX grease Main valve (except membrane 12): KLUBER ISOFLEX SUPER LDS grease

7.3.- DISASSEMBLY INSTRUCTIONS S30 STARTER

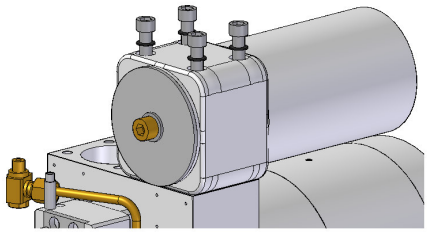
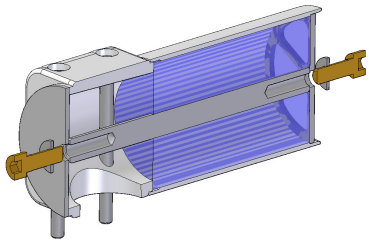
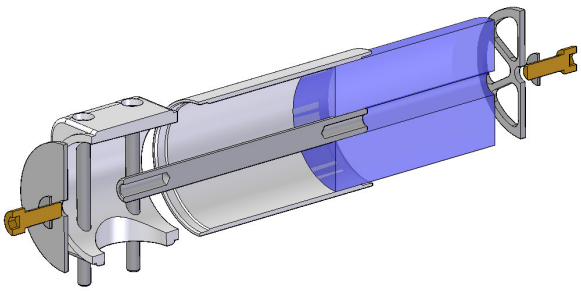
7.3.1.- FRONTAL COVER

	1.- With a fix key, remove the self-locking nut and take-off the pinion. 2.- With allen kay, loose the four screws M12, keeping the cover on his position. 3.- Holding from the fillet of the splined shaft (fixation of the pinion), take out the frontal cover as assembly.
	4.- Place the assembly over a flat surface and loose the splined shaft. 5.- Remove the frontal cover to have access to the internal parts. Pay special attention to the loss of small bearing cylinders, that will become separated.
	6.- Disassembly the internal parts of the assembly. On the frontal cover stay several elements; to make them out: 7.- Disassembly the retaining ring at the end, inserted at pressure. 8.- With pliers for internal ring, loose the stopping ring of the needle bearing. 9.- Take out the needle bearing, inserted at pressure. 10.- Disassembly the outer ring of rotation of the rollers, inserted at pressure.

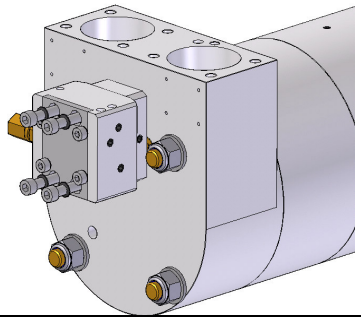
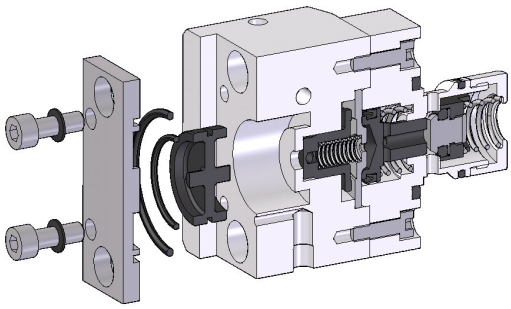
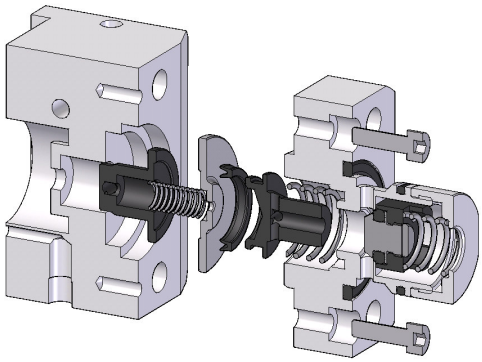
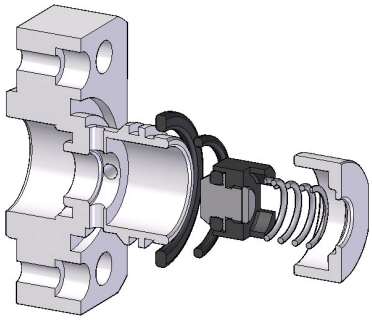
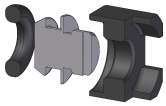
7.3.2.- MAIN VALVE

	1.- With allen key, loose the four screws M8. 2.- With fix key, loose the banjo raccord, placed on the inferior position.
	3.- Hold the assembly onwards. 4.- Pay attention to the losse of the small o-ring between this subassembly and the rear cover of the starter.
	5.- Loosing the four screws M8 at each end of the subassembly with allen key, to divide this in three parts: inlet, main valve body and fast exhaust.
	6.- Loosing the elastic ring with long-nose pliers, to take out the exhaust part. Disassemble the o-ring placed on it. 7.- With long-nose pliers, take out the membrane of her place. It could be neccesary to blow from the lower hole of the part.
	8.- To introduce a flat kay by the lower side, locking the shaft by the flat sides of it. By means of a pipe kay, loose the nut at the end. 9.- With allen key, take out the plug on the upper hole.
	10.- Slide the shaft to take out the piston from his place. The internal elemens of the valve will be separated, with the needed o-rings.
	11.- With fix key, hold the shaft between the flat sides and loose the threaded part. 12.- Take out the membrane, placed at pressure.

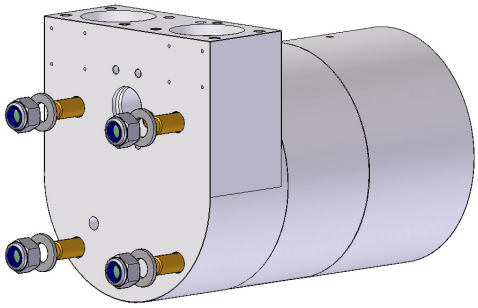
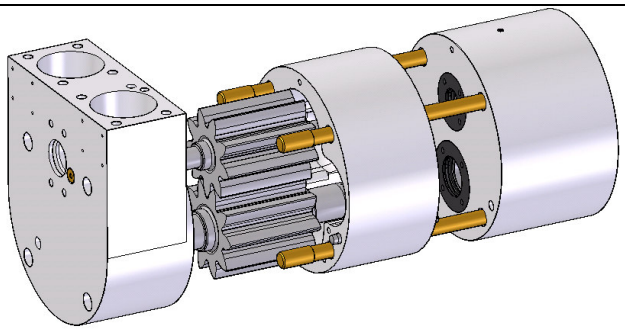
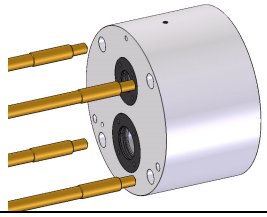
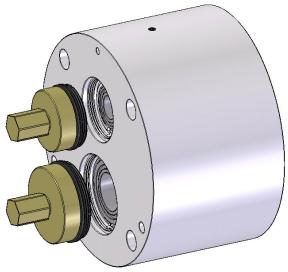
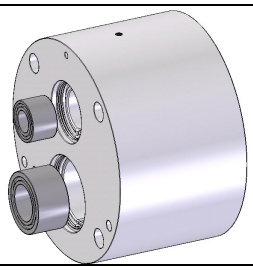
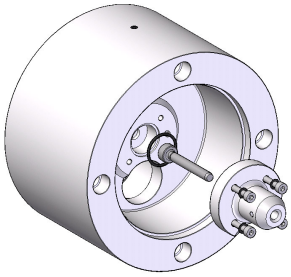
7.3.3.- EXHAUST

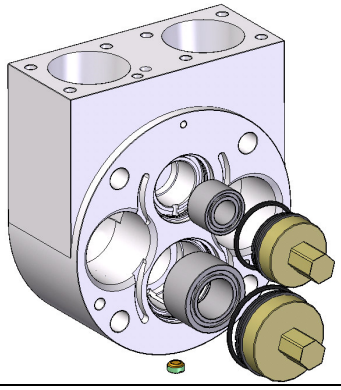
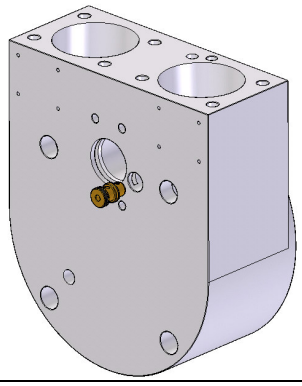
	1.- With allen key, loose the four screws M8.
	2.- By means of two allen keys, loose both screws at the end of the assembly.
	3.- Slide the differents parts to the full dismantling of the assembly.

7.3.4.- SERVOLOCKER

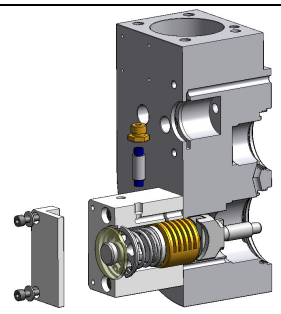
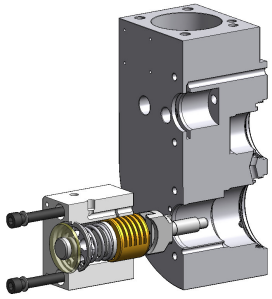
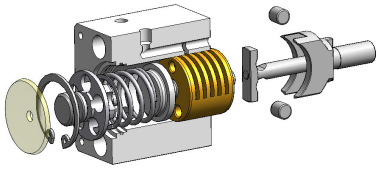
	1.- With allen key, loose four screws M6. 2.- Take out the subassembly, throwing outside.
	3.- With allen key, loose four screws M5. 4.- Remove the rear cover. 5.- Take out the piston. 6.- Take out the o-rings from his places.
	7.- With allen key, loose two screws M4, keeping the parts in his position by hand. 8.- Loose the parts slowly, to avoid jumping parts by the action of internal springs. 9.- Extract the ring of the piston, assembled by pressure on it.
	10.- With universal key, loose the frontal cover. Pay attention, because of the internal spring that could make jump the parts. 11.- Dismantle the o-rings from his palces.
	12.- Hold the square part on a workbenck. 13.- By means of a screwdriver, disassembly the inside part. 14.- Extract the o-ring.

7.3.5.- MOTOR BODY

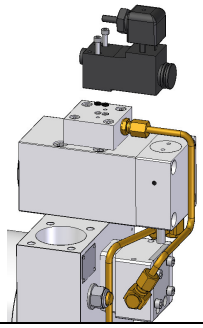
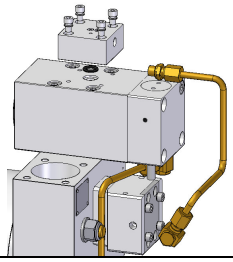
	1.- With fix key, loose the four self-locking nuts M12.
	2.- Stricking slowly with nylon hammer, disassembly the set.
	3.- By means of nut and counter-nut M12, disassembly the stud from the reductor body.
	4.- Take the special GALI keys rep. 5905810 y 5905812. 5.- Put firmly the key 5905810 en the closing ring of the main rotor, matching the position of both parts. Turn slowly the key clockwise if the starter is L and counter clockwise if the starter is R. 6.- Put firmly the key 5905812 en the closing ring of the secundary rotor, matching the position of both parts. Turn slowly the key counter clockwise if the starter is L and clockwise if the starter is R. 7.- Extract the o-rings from his place in the closing rings.
	8.- Extract the external ring of the bearings. The internal ring should be fixed on the rotors. To disassembly this ring, if it where a need to insert some part from the rear side, be careful to not to damage the balls of the bearing.
	9.- With allen key, loose four screws M4. 10.- Throw from the pusher guide to disassembly the internal parts. 11.- With allen key, extract strainer G1/8” placed on the lower side.

	12.- In a similar way, dismount the closing rings of the rear cover, but turning in the opposite way to the rings of the reductor body. 13.- Extract the o-rings, the outer ring of the bearings an the strainer, in the same way than the reductor body.
	14.- By means of a M5 crew, extract the retention valve.
	15.- Disassembly the o-rings, extract the elastic pin sticking with a punch by one of his ends and extract the closing ball.

7.3.6.- CENTRIFUGAL LIMITATOR

	1.- With allen key, loose four screws M4. 2.- Take out the cover. 3.- Throw from the pipes in the upper side.
	4.- With allen key, loose four screws M5. 5.- Take out the subassembly. 6.- Take out the parts attached to the main rotor. Be carefull to not loose the internal rollers.
	7.- Throw out the cover membrane. 8.- With nose pliers, remove the elastic ring slowly, pressing the internal pusher with the hand to avoid jumping parts by the action of internal spring. 9.- Extract the different parts.

7.3.7.- SOLENOID VALVE

	1.- Remove bolt and throw out the electric connector. 2.- With allen key, loose two screws M4. 3.- Take out the solenoid valve. Be careful to not loose the small o-rings under it.
	5.- Untight the nuts of the raccords in the connexion pipe. Throw out to remove the pipe. 5.- With allen key, loose four screws M5. Be carefull to not loose the o-ring under the bracket.

8.- CORRECTION OF POSSIBLE FAULT

ALWAYS RESPECT THE SAFETY INSTRUCTIONS OF POINT 6 OF THIS MANUAL

	FAILURE	POSSIBLE CAUSE	CORRECTION
1	Pressing push-button, starter does not respond and not airflow seems to exist in control circuit.	• Empty air receiver (s)	• Charge receiver (s)
		• Flow valve (s) closed.	• Open flow valve (s)
		• Control circuit blocked.	• Disconnect and clean out
		• There is not signal for the electro valve	• Control signal
2	Pressing push-button, starter does not respond, although air flows through control circuit	• Leak in control duct.	• Repair or replace.
		• Insufficient air pressure	• Increase pressure in receiver
		• Servolocker sticking in closed position	• Remove and check both, smoothen guides or change parts.
		• Push-button stuck.	• Remove and clean the same
		• Excessive length on main air pipe work	• Approach push-button to starter or install a solenoid valve near the latter
3	Pinion revolves and advances, but does not engage the ring gear.	• Ring gear and/or pinion have burrs or are damaged	• Clean burrs or replace if necessary. Replace pinion by a more adequate one.
		• Lack of clearance between pinion and ring gear	• Check by distortion of ring gear.
4	Pinion revolves but does not advance	• Push-rod (spare part 06) inoperative	• Disassemble, check, smoothen guide diameter, clean or replace if rusted
		• Insufficient air pressure	• Increase pressure in receiver.
		• Splined shaft (spare part 15) sticking	• Disassemble and clean, check spring (spare part 14) and reassemble.
		• Excessive length of control pipe.	• Approach push-button to starter or install a solenoid valve near the latter
5	Pinion advances but does not rotate.	• Pneumatic motor inoperative	• Disassemble; inspect rotors for foreign matters between teeth and for possible wear of gears, spindles and bearing. Clean, oil and reassemble. Replace worn parts.
		• Check valve (spare part 29) stuck of blocked.	• Disassemble, clean, oil and reassemble.
6	Pinion engages gear ring, but will not turn engine.	• Main valve (spare part 79) blocked.	• Disassemble, clean, oil and reassemble or replace main valve.
		• Rotors worn or blocked.	• Disassemble, clean, oil and reassemble or replace rotors.
		• Insufficient air pressure	• Increase pressure in receiver.
		• Main air pipe work restricted or insufficient bore.	• Check all pipe work and replace joint it if necessary.
		• Membrane (spare part 104) broken.	• Replace it.
7	Starter starts working upon opening the flow valve of the feed line,	• Incorrect connection of control pipes.	• Connect control pipes as per installations instructions.

	FAILURE	POSSIBLE CAUSE	CORRECTION
	although push-button (or solenoid valve) are not actuated.	• Main valve (spare part 79) blocked and open, solenoid valve or servolocker bloqued or broken.	• Disassemble, clean oil and replace joint if needed.
8	Lack of starter power..	• Main pipe work chocked or its bore is less than stipulated for the starter.	• Check all the piping , and replace if the inside diameter is not correct.
		• Insufficient air pressure.	• Increase pressure in receiver.
		• Badly worn rotors.	• Replace them.
		• Incorrect bore of main pipe work.	• Check entire pipe work for correct bore and replace if incorrect.
		• Idling of main valve (spare part 79).	• Disassemble, clean, oil and reassemble.
9	After starting the engine, pinion tries to-reengage and hits the ring gear, which results in damage to both.	• Servolocker blocked.	• Disassemble, clean, oil and reassemble. replace if needed.
10	Starter don't stop.	• Main valve (spare part 79) blocked	• Disassemble, clean, oil and reassemble.
		• Servolocker defective.	• Disassemble, clean, oil and reassemble. Replace if needed.
		• Valve (spare part 29) does not close properly	• Disassemble, check for correct closing of the ball and the plug, press the valve against its seat.
		• Splined shaft (spare part 15) blocked.	• Disassemble, clean, check spring 14

9.- ACCESSORIES FOR INSTALLATION

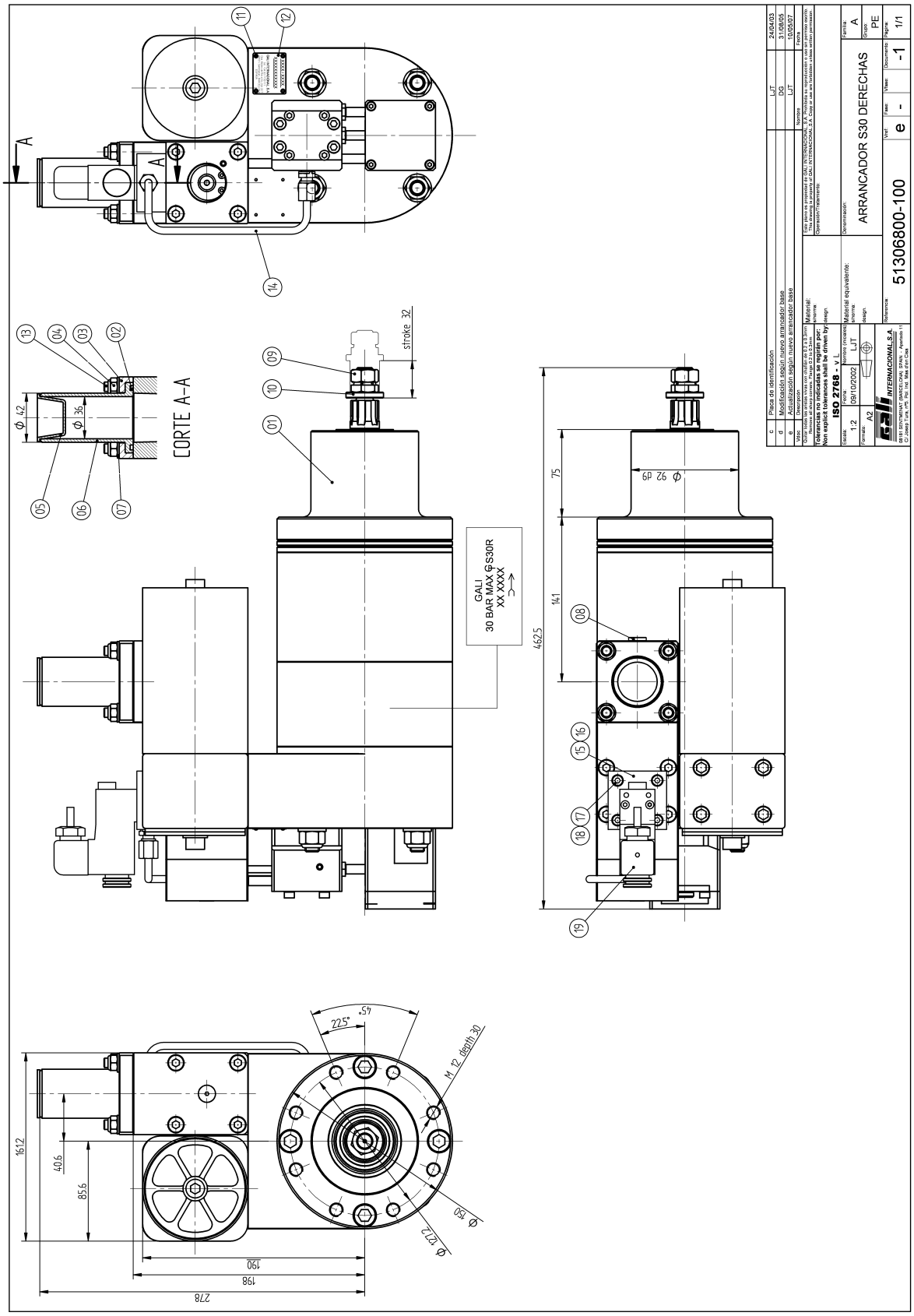
Complete installation of any motor can be carried out on order.

GALI supplies the following accessories to facilitate the assembly of its equipments:

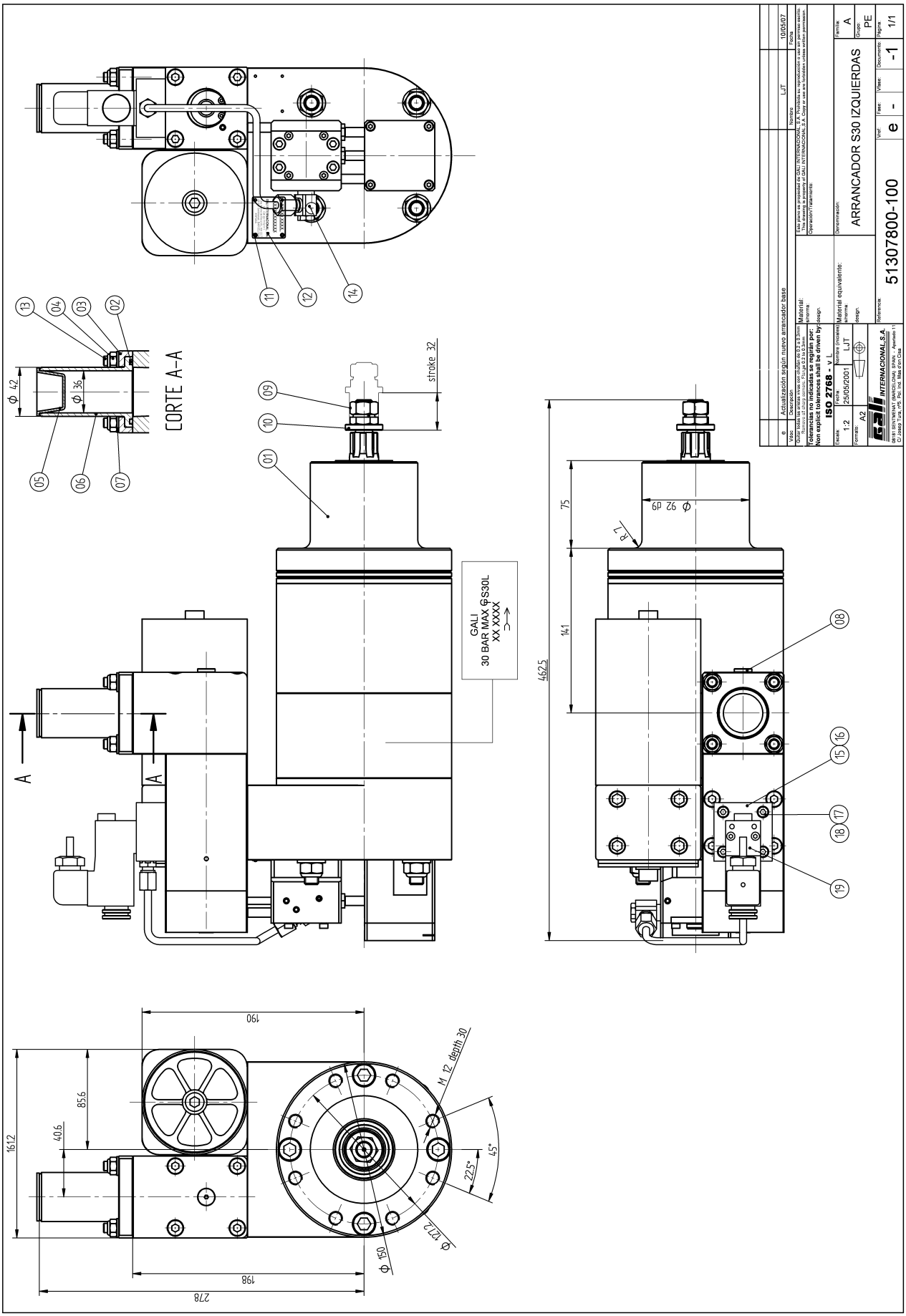
- Driving pinions
- Front mounting flanges
- Intake filters
- Intake nozzle and inlet elbows
- Push-button and solenoid valves

10 .- ASSEMBLY DRAWING AND EXTERNAL DIMENSIONS

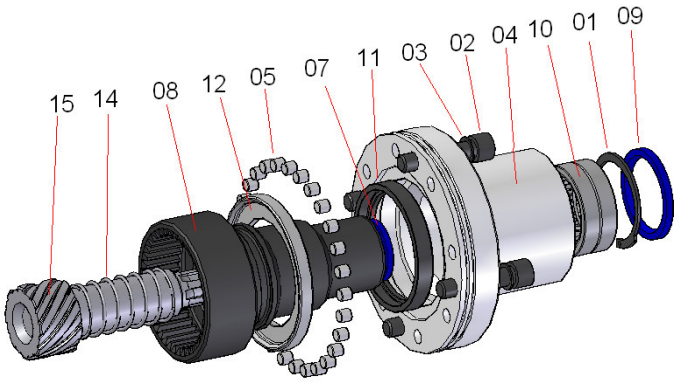
10.1.- RIGHT TURNING STARTER 51306800-100:



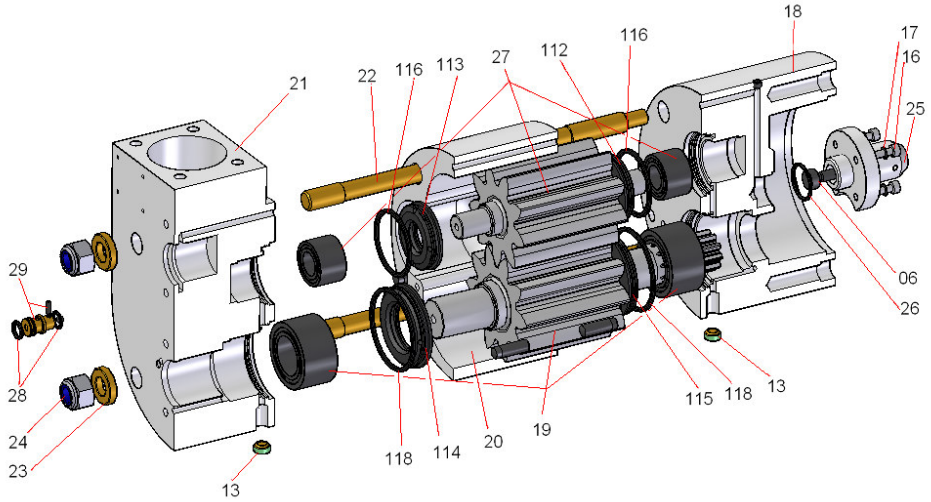
10.2.- LEFT TURNING STARTER 51307800-100:



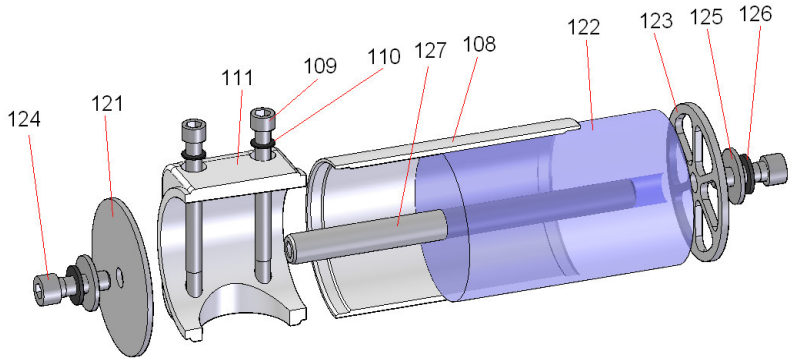
11.- BILL OF MATERIALS



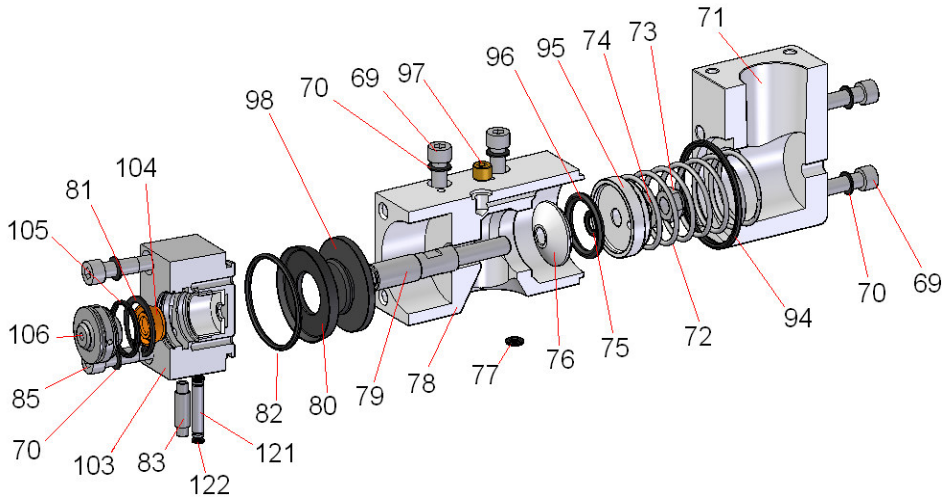
ID.	REP. 51306800	REP. 51307800	DESIGNATION	QTY.	OBS.
01	0276202	0276202	ELASTIC RING	1	
02	0071255	0071255	ALLEN BOLT	4	
03	1251001	1251001	WASHER	4	
04	51306101.001	51306101.001	FRONTAL COVER	1	
05	0820808	0820808	ROLLER DIAM 8x8	28	
07	0384204	0384204	RETAINING RING	1	SET OF SEALS
08	51306108	51307108	CROWN	1	
09	0385005	0385005	RETAINING RING	1	SET OF SEALS
10	0925025	0925025	NEEDLE BEARING	1	
11	51306104	51306104	EXTERNAL RING	1	
12	51306105	51306105	CENTER RING	1	
14	51306106	51307106	SPRING	1	
15	51306109	51307109	SPLINED SHAFT	1	



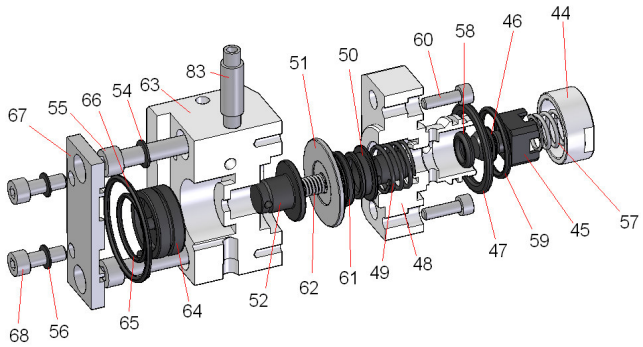
ID.	REP. 51306800	REP. 51307800	DESIGNATION	QTY.	OBS.
06	51306205	51306205	PUSHER	1	
13	772002401	772002401	STRAINER	2	
16	0070415	0070415	ALLEN BOLT	4	
17	1250405	1250405	WASHER	4	
18	5290303	5290304	REDUCTOR BODY ASSEMBLY	1	
19	51306225	51306225	MAIN ROTOR ASSEMBLY	1	REPAIR KIT
20	5290347	5290347	MOTOR BODY ASSEMBLY	1	
21	51306249	51307249	REAR COVER	1	
22	51306206	51306206	STUD	4	
23	0151225	0151225	WASHER	4	
24	0121275	0121275	SELFLOCKING NUT	4	
25	51306224	51307224	PUSHER GUIDE	1	
26	0302015	0302015	O-RING	1	SET OF SEALS
27	51306227	51306227	SECUNDARY ROTOR ASSEMBLY	1	REPAIR KIT
28	0300815	0300815	O-RING	2	SET OF SEALS
29	5290726	5290726	RETENTION VALVE ASSEMBLY	1	
112	51306231	51306232	SECUNDARY CLOSE RING	1	
113	51306232	51306231	SECUNDARY CLOSE RING	1	
114	51306230	51306229	PRIMARY CLOSE RING	1	
115	51306229	51306230	PRIMARY CLOSE RING	1	
116	0303802	0303802	O-RING	2	SET OF SEALS
118	0304802	0304802	O-RING	2	SET OF SEALS



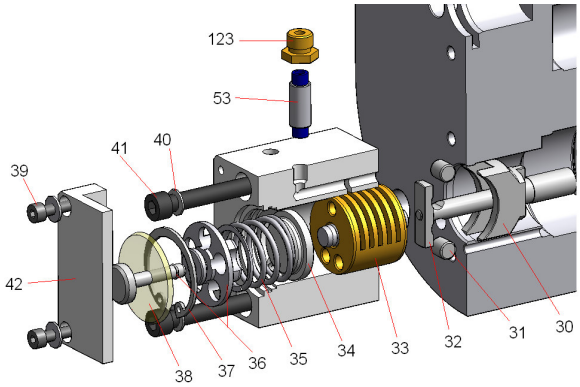
ID.	REP. 51306800	REP. 51307800	DESIGNATION	QTY.	OBS.
108	51306611	51306611	EXHAUST PIPE	1	
109	0070800	0070800	ALLEN BOLT	4	
110	1250808	1250808	WASHER	4	
111	51306602	51306602	EXHAUST BRACKET	1	
121	51306614	51306614	RETENTION DISC	1	
122	51306608.1	51306608.1	MESH	1	
123	51306613	51306613	RETENTION RING	1	
124	0071030.40	0071030.40	ALLEN BOLT	2	
125	0151025	0151025	WASHER	2	
126	1251001	1251001	WASHER	2	
127	51306612	51306612	STUD	1	



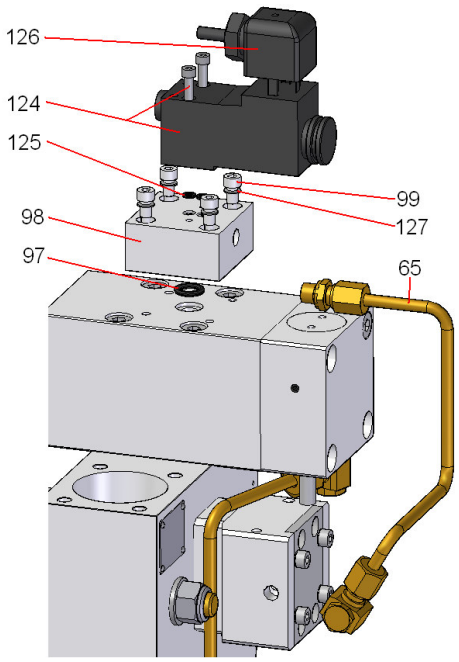
ID.	REP. 51306800	REP. 51307800	DESIGNATION	QTY.	OBS.
69	0070880	0070880	ALLEN BOLT	8	
70	1250808	1250808	WASHER	12	
71	51306403	51306403	AIR INLET	1	
72	51306412	51306412	SPRING	1	
73	0121012.30	0121012.30	NUT	1	
74	0151002.30	0151002.30	WASHER	1	
75	0309524	0309524	O-RING	1	SET OF SEALS
76	51306405	51306405	SOCKET	1	
77	0300602	0300602	O-RING	1	SET OF SEALS
78	51306401	51307401	BODY	1	
79	51306402.1	51306402.1	VALVE SHAFT	1	
80	51306414	51306414	SEALER RING	1	SET OF SEALS
81	0263212	0263212	ELASTIC RING	1	
82	0305125	0305125	O-RING	1	SET OF SEALS
83	51206413	51206413	PIPE	1	SET OF SEALS
85	0070845	0070845	ALLEN BOLT	4	
94	0305803	0305803	O-RING	1	SET OF SEALS
95	51306406	51306406	SEALER BRACKET	1	
96	0303404	0303404	O-RING	1	SET OF SEALS
97	0639708	0639708	PLUG	1	
98	51306402.2	51306402.2	VALVE BRACKET	1	
103	51306420	51307420	FAST EXHAUST BODY	1	
104	51206404	51206404	MEMBRANE	1	SET OF SEALS
105	0302502	0302502	O-RING	1	SET OF SEALS
106	51206411	51206411	SEAT VALVE	1	
121	51306315	51306315	PIPE	1	
122	0300401	0300401	O-RING	2	SET OF SEALS



ID.	REP. 51306800	REP. 51307800	DESIGNATION	QTY.	OBS.
44	51306554	51306554	SERVOLOCKING COVER	1	
45	51306559	51306559	SERVOLOCKING VALVE GUIDE	1	
46	51306560	51306560	SERVOLOCKING SEALER BRACKET	1	
47	0302603	0302603	O-RING	1	SET OF SEALS
48	5290824	5290824	SERVOCOMMAND BODY ASSEMBLY	1	
49	51306562	51306562	SPRING	1	
50	51306558	51306558	PISTON	1	
51	51306557	51306557	VALVE SUPPORT	1	
52	51306556	51306556	VALVE	1	
54	1250607	1250607	WASHER	4	
55	0070650	0070650	ALLEN BOLT	4	
56	1250506	1250506	WASHER	4	
57	51306561	51306561	SPRING	1	
58	0300703	0300703	O-RING	1	SET OF SEALS
59	0302102	0302102	O-RING	1	SET OF SEALS
60	0070415	0070415	ALLEN BOLT	2	
61	0311503	0311503	RING	1	SET OF SEALS
62	51306563	51306563	SPRING	1	
63	5290822	5290823	SERVOLOCKER BODY	1	
64	51306555	51306555	SERVOLOCKER PISTON	1	
65	0302215	0302215	O-RING	1	SET OF SEALS
66	0303602	0303602	O-RING	1	SET OF SEALS
67	51306553	51306553	REAR COVER SERVOLOCKER	1	
68	0070515	0070515	ALLEN BOLT	4	
83	51206413	51206413	CONNECTION PIPE ASSEMBLY	1	SET OF SEALS



ID.	REP. 51306800	REP. 51307800	DESIGNATION	QTY.	OBS.
30	51206311	51206311	CIRCULAR PATH	1	
31	0820707	0820707	ROLLER	1	
32	51206303	51206303	FLAT PATH	1	
33	5290830	5290830	REGULATOR BODY	1	
34	51206305	51206305	SPRING SUPPORT	1	
35	51306308	51306308	SPRING	1	
36	5290665	5290665	PUSHER ASSEMBLY	1	
37	0263212	0263212	ELASTIC RING	1	
38	51206306	51206306	MEMBRANE	1	SET OF SEALS
39	0070415	0070415	SCREW	4	
40	1250607	1250607	WASHER	4	
41	0070655	0070655	SCREW	4	
42	51206310	51206310	COVER	1	
53	51306316	51306316	PIPE	1	SET OF SEALS
123	51306314	51306314	CONNECTION	1	



ID.	REP. 51306800	REP. 51307800	DESIGNATION	QTY.	OBS.
65	51306462	51307462	CONNECTION PIPE	1	
97	0309524	0309524	O-RING	1	SET OF SEALS
98	51206461	51206461	BRACKET	1	
99	0070525	0070525	SCREW	4	
124	1911544	1911544	SOLENOID VALVE	1	
125	0300412	0300412	O-RING	2	
126	94800247	94800247	CONECTOR	1	
127	1250506	1250506	WASHER	4	

REPAIR KIT (includes set of seals)	5290831
SET OF SEALS	5290036

11.1.- SPECIFYC SPARES 51306800-100 and 51307800-100 *(See figure EXTERNAL DIMENSIONS)*

POS.	REF. Nº	DESIGNACION	CANT.	OBSERV.
02	0304735	O-RING	1	SET OF SEALS
03	51306407	FLANGE	1	
04	0120808	NUT	4	
06	51306408	INLET PIPE	1	
07	0150816	WASHER	4	
08	0639710	PLUG	1	
09	0121420	NUT	1	
10	51306107	WASHER	1	
13	51306409	STUD	4	

13.- DISTRIBUTION AND SERVICE

GALI GROUP

ESPAÑA:
GALI INTERNACIONAL, S.A.
Polígono Industrial Mas d'en Cisa
C/ Josep Tura, 5
08181-Sentmenat - BARCELONA
Apartado 11
Tel. 93 715 31 11
Fax 93 726 43 85 / 715 07 51

FRANCE: GALI FRANCE, S.A. 66200 ELNE Rue B. Thimonnier – Z.I. Tel. 468 22 20 05 Fax 468 22 47 44	**DEUTSCHLAND (D):** GALI DEUTSCHLAND GmbH 55411 BINGEN Am Ockenheimer Graben 32 Tel. 0049-6721-10026/10027 Fax 0049-6721-13144	**ITALIA:** GALI ITALIA, s.r.l. 22070 SENNA COMASCO (CO) Via Canturina Vecchia, 19 Tel. 31 461 224 – 461 230 Fax 31 461 245	**CHINA:** GALI INTERNACIONAL, S.A. SHANGHAI OFFICE Room 808, Century Space Building Urumoi Bei Road, 199 SHANGHAI – Post code 200040 Tel. 86-21-62489643 Fax 86-21-62489745

OTHER COMPANIES

ESPAÑA TANAJET, S.L. 08039 BARCELONA Muelle Levante, 5 Tel. 93 221 19 48 Fax 93 221 30 78	COMERCIAL DIESEL, S.L. 20110 PASAJE SAN PEDRO GUIPÚZCOA Arrandegi, 2 Tel. 943 40 11 12 Fax 943 39 13 72	ARDORA, S.A. 36208 VIGO Tomás A. Alonso, 150-152 Tel. 986 21 32 38 Fax 986 21 45 77 Teles 83206	DISTRIMAR, S.L. 35009 LAS PALMAS GRAN CANARIA Urbanización Nueva Isleta Bloque 6 bajos Tel. 928 46 61 55 Fax 928 46 72 07
FRANCE: GASCOGNE ENERGELEC 32000 AUCH 4 Rue Amiral Bugard Tel. 562 05 41 31 Fax 562 05 38 78	LES BRUYERES F.I.R.E.M. 13011 MARSEILLE 116 Boule de la Pomme Tel 491 95 25 13 Fax 491 35 29 09	ETS. LEPETIT 76600 LE HAVRE 80-84, R. Aviateur Guerin Tel. 232 74 98 40 Fax 232 74 98 49	S.A.D. – SOCIETE D'APPLICATIONS DIESEL 57000 THIONVILLE 50, Rue de da Digue Tel. 382 88 62 62 Fax 382 88 58 36
AES BUEAS 44300 NANTES 38, Rue l'Ouche Buron Tel. 251 89 62 62 Fax 240 49 99 67			
DEUTSCHLAND (D) CARL BAGUHN GmbH 20537 HAMBURG Wendenstrasse 252 Tel. 0049-40-251 55-119 Fax 0049-40-251 55-150	**NEDERLAND:** A D T B.V. 3300 AK DORDRECHT Buitenkalkhaven 2/6 Tel. 78 613 61 77 Fax 78 614 97 42	**NORGE:** SEA-TEK A/S 1820 SPYDEBERG Villaveien 1 U Tel. 69 83 80 80 Fax 69 83 83 66	**SVERIGE:** ATLAS MARIN & INDUSTRI 41502 GOTEBORG Marielholmsgatan 40 Tel. 31 84 45 50 Fax 31 25 65 09
PORTUGAL: JAMECOR PRODUCTOS QUÍMICOS 4200 PORTO D. Eduardo Santos Silva, 261 Tel. 2 540 07 65 Fax 2 540 20 78			
KOREA: SAMSAWON, INC. 110-607 SEOUL CHONGO-KU Tel. 2 395 34 00 Fax 2 396 03 40	**SINGAPORE:** ADEX ZONEX PTE. LTD. 628623 SINGAPORE 1 LOK YANG WAY NO.19B, JURON Tel. 261 56 11 Fax 266 53 32	**NEW ZEALAND:** VM DIESELS (NZ) LIMITED 118-120 NELSON STREET PETONE Tel. 4 568 88 43 Fax 4 568 56 43	